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ABSTRACT

Children's understanding of metaphorical language at different ages is explored. Comprehension of sensory, functional, and psychological metaphors was measured with a sentence completion task on kindergarten, second grade, fourth grade, and college subjects. Children's understanding of the metaphors was ordered from best to worst: sensory, functional, and psychological, whereas for adults there were no differences. All groups understood sensory metaphors equally well, but age differences occurred for functional and psychological metaphors. Children frequently offered sensory interpretations of functional and psychological metaphors. The data support the view that general metaphor comprehension is present early. However, because psychological and functional levels of understanding emerge later in development, understanding these kinds of metaphors may be dependant on specific domain knowledge.
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This Room is a Junkyard!:

Children's Comprehension of Metaphorical Language

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Presented at the Biennial Meeting of

The Society for Research in Child Development

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Abstract

This study explores the level at which children at different ages understand metaphorical language. Comprehension of sensory, functional and psychological metaphors was measured with a sentence completion task on kindergarten, second grade, fourth grade, and college subjects. Children's understanding of the metaphors was ordered from best to worst: sensory, functional, and psychological, whereas for adults there were no differences. All groups understood sensory metaphors equally well, but age differences occurred for functional and psychological metaphors. Children frequently offered sensory interpretations of functional and psychological metaphors. The data support the view that general metaphor comprehension is present early. However, since psychological and functional levels of understanding emerge later in development, understanding these kinds of metaphors may be dependent on specific domain knowledge.

This Room is a Junkyard!:

Children's Comprehension of Metaphorical Language

This paper reports a study on the qualitative development of children's metaphorical thinking. Previous research has found metaphor comprehension to be an age-dependent, developmental phenomenon (Billow, 1975; Cometa & Eson, 1978; Pollio & Pollio, 1977; Vosniadou, Ortony, Reynolds, & Wilson, 1984; Winner, Rosenstiel, & Gardner, 1976; Winner, Engel, & Gardner, 1980). There is conflict, however, over when children are first able to understand metaphors. Some studies do not find evidence of metaphor comprehension until early adolescence (Asch & Nerlove, 1960; Billow, 1975; Cometa & Eson, 1978)), whereas other studies find at least rudimentary understanding in children as young as four or five years of age (Keil, 1986; Vosniadou, Ortony, Reynolds, & Wilson, 1984).

How might the variation among previous results be reconciled? Rather than conceptualizing metaphor comprehension as an all-or-none phenomenon, the present author suggests that there may be different levels of metaphoric understanding that children have at different stages of development. Each level is defined by the type of knowledge required for understanding of the metaphor. The distinction among levels of understanding is of vital assistance when interpreting previous studies. Those studies using metaphors which required knowledge at the conceptually abstract level (Billow, 1975; Cometa & Eson, 1978; Winner, Rosenstiel & Gardner, 1976) tend to find comprehension at a later age than those using metaphors which made minimal knowledge demands (Keil, 1986; Vosniadou, Ortony,

Reynolds, & Wilson, 1984). From a levels-of-understanding viewpoint, young children may be able to understand metaphors at a level which makes few knowledge demands, but not at a level that demands knowledge beyond their experience. Thus, children at different ages may share a basic ability to think metaphorically. However, variation among children of different ages may reflect differences in their level of understanding, which is necessarily tied to their level of knowledge. The present study distinguishes between three levels of metaphoric understanding that are likely to be age and knowledge-related and tests whether or not children can demonstrate comprehension at one or more of these levels.

In order to address the level of understanding question in metaphor comprehension, three factors first must be taken into consideration: the definition of metaphor and the metaphor comprehension process; the child's knowledge of the terms in the metaphor; and the experimental procedure used to assess metaphor comprehension. Each of these factors now will be examined in turn.

The Definition of Metaphor and the Metaphor Comprehension Process

In the present study, a metaphor is defined as an implicit comparison of two terms from different semantic domains (Ortony, 1979). For example, the metaphor *clouds in the sky are giant marshmallows* compares *clouds*, a term from the domain of atmospheric entities to *marshmallows*, a term from the domain of sweet foods. The components of a metaphor are: the *topic*, which is the subject of the metaphor; the *vehicle*, which is the term that defines the topic; and the *ground*, which is the point of similitude between the topic and the vehicle. In the previous example, *clouds* is

the topic linked to the vehicle *marshmallows* by the common ground of being white and fluffy. The comparison of the metaphor's topic and vehicle is considered implicit in the absence of any explicit comparison terms such as like or as.

In understanding a metaphor, the child first must recognize that the metaphor is not to be taken literally (Readance, Baldwin, Martin, & O'Brien, 1984; Winner, 1988). For example, in understanding *Tim's brother is a rock*, the child must realize that *Tim's brother* is not literally an inanimate stone. Rather, the child must infer that an implicit comparison is being made. *Tim's brother* must be like a rock in some way. If a child does in fact recognize the metaphor as an implicit comparison, then the child may draw upon his or her knowledge of the topic and vehicle to make a metaphoric comparison. For example, a child may apply his or her knowledge to understand that hardness is what *Tim's brother* and a *rock* have in common.

Metaphoric comparisons may be made at three different levels which are distinguishable by the type and depth of knowledge necessary for understanding. At the most basic level are *sensory* metaphors, which require only familiarity with the physical features of the topic and the vehicle (e.g., *clouds in the sky are giant marshmallows*). *Functional* metaphors are second up on the levels-of-understanding ladder. These metaphors demand an understanding of shared functional properties of objects (e.g., *the empty garbage can is a drum*). At the highest level of conceptual understanding are *psychological* metaphors, which compare the physical features of the vehicle to the psychological properties of the

topic (e.g., *Alice's friend is an icecube*). Psychological metaphors often require knowledge of polysemous words (e.g., cold for the previous metaphor).

Of interest to the present study is the fact that both functional and psychological metaphors allow interpretations at at least two different levels, one of which is sensory. Sensory metaphors, on the other hand, allow only a sensory interpretation. For example, the functional metaphor, *the empty garbage can is a drum*, has two potential interpretations. *The empty garbage can* may be a *drum* because it is cylindrical and hollow like a drum (sensory), or it may be a drum because one can tap on it rhythmically like a drum (functional). Likewise, the psychological metaphor, *Alice's friend is an icecube* can be interpreted at both the sensory and psychological levels. *Alice's friend* may be an *icecube* because she is physically-cold from walking outside in the snow (sensory), or she may be an *icecube* because she is an aloof-cold person (psychological). In contrast, *clouds in the sky are giant marshmallows* allows only the sensory metaphoric interpretation that both *clouds* and *marshmallows* are white and fluffy.

In testing for metaphor comprehension, the child may give a sensory-level interpretation for a functional or psychological metaphor. The level of metaphoric comparison a child chooses is likely to be determined by the type of knowledge the child possesses about the topic and the vehicle.

Children's Knowledge of the Terms in the Metaphor

The present study assumes that the child's knowledge of a topic and vehicle determines which of the three levels they will

choose for making metaphoric comparisons. Since differences in knowledge are age-related, the present study compares children at different grade levels. The empirical question then becomes, at what level will children at different ages perform? Studies of development across a variety of knowledge domains frequently find that children move from sensory or physical levels of understanding to more abstract or psychological levels (Chi, 1979; Bruner, 1966; Livesley & Bromley, 1973). Furthermore, sensory understanding occurs early in development. Thus, it is expected that most, if not all, of the youngest children in this study would be able to make sensory metaphoric comparisons. Furthermore, since functional and psychological metaphors allow sensory interpretations, the younger children may be expected to make sensory interpretations of these metaphors when they lack adequate conceptual knowledge.

Functional metaphors are more abstract than sensory metaphors because they invoke actions that are afforded by the physical properties of the objects. They are, however, less abstract than psychological metaphors which have little or no tangible referent. Therefore, knowledge and age differences would favor functional metaphoric development earlier than psychological metaphorical understanding.

Assessing Children's Competence in Metaphorical Understanding

How can one assess a child's level of understanding for a particular metaphor? One could ask a child to explain the meaning of various metaphors. This has been done in many previous studies (e.g., Asch & Nerlove, 1960; Billow, 1975; Cometa & Eson, 1978; Winner, Rosenstiel, & Gardner, 1976; Winner, Engel, & Gardner,

1980). Verbal explication, however, leads to underestimates of competence because it relies heavily upon the child's linguistic and metacognitive abilities to express such knowledge. An alternative procedure is the verbal or nonverbal forced-choice test (Dent, 1984; Pollio & Pollio, 1977; Reynolds & Ortony, 1980; Winner, Engel, & Gardner, 1980; Vosniadou & Ortony, 1983; Vosniadou et al., 1984). Although less demanding than verbal explication, this procedure is limited in the types and number of alternatives that can be offered. The choice a child makes may reveal only the child's preference for one alternative over another, and not what the child understood in the absence of the choice.

In consideration of the problems with both the verbal explication and forced-choice tasks, a task was chosen which eliminated the vagaries of asking a child to explain a metaphor's meaning, while at the same time allowed a free response. The sentence completion task appears satisfy these criteria (MacKay, 1966; MacKay & Konishi, 1980; Piaget, 1928/69; Trabasso, Stein, & Johnson, 1981.) Here, children are asked to complete metaphoric phrases such as *Tim said his brother is a rock because....* In the phrase the conjunction "because " requires the child to provide reasons for its assertion. If the child understands the metaphor as an implicit comparison and can draw a similarity between the topic and the vehicle, then a metaphorical ground should be given as the reason for the assertion. Because the child is free to produce whatever ground he or she chooses, the task should be sensitive to the level of metaphoric comparison. For example, in completing the previous phrase, the child may explain that Tim made the statement

because his brother has hard muscles (sensory ground) or because his brother is always dependable (psychological ground).

Method

Subjects

The children in this study were 60 male and female students of a public elementary school. They were equally divided among three grades: kindergarten (mean age: 5 years; 10 months), second (mean age: 8;00), and fourth (mean age: 9;10). The adult subjects were twenty male and female college students (mean age: 19;3) who volunteered to participate in the study.

Materials

Nine metaphoric phrases were used as materials and are listed in Appendix A. Each metaphoric phrase was the stated clause of a sentence in the form of "____ said an A is a B because...." The terms in each metaphor were considered to be part of the children's vocabulary by the children's teachers. Three of the metaphors were sensory, three were functional, and three were psychological. Functional metaphors were based on functions which the children could experience during symbolic play. In addition to the test materials, two sensory metaphoric phrases were used as practice phrases; these also are listed in Appendix A.

Procedure

Subjects were tested individually in tape-recorded sessions which lasted approximately five to ten minutes. The children were read the following instructions, "I'm going to read you the beginning of a sentence, and I want you to finish it anyway you want. For example, if I said to you, 'People should not eat too much candy

because...' then you could say something like 'they will get sick' or 'they will get cavities.' We'll do two practice sentences, and then we'll start the game." Adult subjects heard the same instructions but also were told, "the sentences may sound similar to those found in children's literature, so don't let that surprise you." Subjects were then given two practice phrases to complete.

The experimenter presented the fragments in random order. If the meaning of a subject's response was ambiguous, the experimenter probed the subject for a more specific answer. For example, some subjects responded "she was cold" to the phrase, "Alice said her friend was an ice cube because...." Since it is not clear in this case whether the subject intended the psychological or physical meaning of "cold," the experimenter inquired by asking, "how was she cold?"

If a subject responded "I don't know" to a phrase, the experimenter rephrased the completion as a direct question and then repeated the phrase in the original form to the subject. For example, the rephrasing of "Alice said her friend was an ice cube because..." was "Why would Alice call her friend an ice cube?" Only five subjects responded "I don't know," and the experimenter rephrased only one sentence stem for each of these children.

Scoring

Completions of each metaphoric phrase were scored on three levels of analysis. First, each response was scored as being either a metaphorical ground or a nonmetaphorical statement. Nonmetaphorical responses were then further classified as being either incomplete, magical or metonymic based on guidelines derived

from Winner, Rosenstiel, and Gardner (1976). Metaphorical responses were further classified by type, i.e., sensory, functional or psychological. Once the type of each metaphorical response was determined, these responses were further coded as being the intended ground or not. An intended ground was defined by a match between the type of metaphor presented by the experimenter and the type of ground generated by the subject, i.e., a functional ground for a functional metaphor was coded as the intended ground, whereas a sensory ground given for a functional metaphor was not. Appendix B presents definitions and examples of each type of response. Raters discussed responses whose classifications were questionable until 100% agreement was reached.

Results

The first finding of interest is that all grades showed a high rate of metaphorical sentence completions. The percentage of all responses that were metaphorical grounds were: 74, 88, 97 and 100 for kindergarten, second grade, fourth grade and college, respectively. The number of grounds produced by each child was entered into a One-Way Analysis of Variance with grade as the between subjects variable. The analysis showed a significant grade effect, $F(3)=15.83$, $p<.01$. Newman Keuls Post Hoc Comparisons showed a significant developmental trend. Kindergarten children understood significantly fewer metaphors than the three other groups. Second graders also understood fewer metaphors than fourth grade and college subjects. The difference between the mean number of metaphorical responses was insignificant for the fourth graders and college students. The developmental trend in

metaphorical responses is not, however, as striking as the finding that even the youngest children in this study generated metaphorical grounds a vast majority of the time.

Figure 1 shows the percentage of *intended* metaphorical grounds produced by each grade for each type of metaphor. As can be seen from this graph, there were metaphor and grade differences in producing intended grounds and these factors interacted. When the intended metaphor was at the sensory level, all four grades produced sensory grounds at a very high rate and with virtually no developmental differences. Compared to the sensory metaphors, the rate of producing functional grounds was lower for the younger two groups. However, the oldest two groups were nearly perfect in providing both sensory and functional grounds. The most striking developmental changes occurred for psychological metaphors with the youngest children virtually at zero response rate. From kindergarten onward, the growth is exponential in shape. Furthermore, relative to the other two types, psychological metaphors yielded the fewest intended grounds at each grade level. These interpretations were confirmed by a mixed design Analysis of Variance where grade was the between-subjects variable and metaphor type was the within-subjects variable. There were highly significant main effects for metaphor type, $F(2, 152)=240.03$, $p<.01$ and for grade, $F(3, 76)=73.90$, $p<.01$. The grade by metaphor interaction also was significant, $F(6,152)=31.64$, $p<.01$.

The data reported in Figure 1 show that the younger subjects frequently failed to give the intended metaphorical grounds for functional and psychological metaphors. Yet these children did show

a high rate of metaphorical response, as reported previously. This high rate is largely due to the younger subjects' tendency to give sensory grounds for functional and psychological metaphors. Figure 2 shows the probability of a sensory metaphoric ground given for either a functional or a psychological metaphor based on the correct number of functional and psychological responses. Young children had a high probability of giving sensory interpretations for functional and psychological metaphors, but this probability declined with age. Furthermore, there was a lower probability of giving a sensory ground for a functional metaphor than for a psychological metaphor at each grade level. The interaction in Figure 2 is inversely related to the data on intended grounds in Figure 1, indicating that when children do not possess adequate knowledge at a nonsensory level, they operate at the sensory level instead. These probabilities were confirmed by statistical analyses. The mean number of sensory level responses for functional and psychological metaphors was entered into a mixed design Analysis of Variance where grade was the between-subjects factor and metaphor type was the within-subjects factor. There were significant main effects of grade, $F(3)=23.431$, $p<.01$ and metaphor type, $F(1)=53.67$, $p<.01$. The grade by metaphor type interaction also was significant, $F(3)=10.24$, $p<.01$.

Discussion

The first finding of interest is that subjects at each grade level produced metaphorical grounds at a very high rate. Thus, it appears that children were able to meet the processing demands posed by metaphorical language. Children did not take the metaphors literally.

Rather, they perceived each statement appropriately as an implicit comparison. Subsequently, they drew some type of similarity between the topic and the vehicle. Although there were developmental differences in the percentage of metaphorical grounds children produced, the discrepancies are not as striking as the fact that children at each grade level understood metaphor a majority of the time. The results of this study are more consistent with research that finds metaphor comprehension to be an early development (Keil, 1986; Vosniadou, Ortony, Reynolds, & Wilson, 1984) than with studies that suggest comprehension to emerge fully with adolescence (Asch & Nerlove, 1960; Billow, 1975; Cometa & Eson, 1978; Winner, Rosenstiel, & Gardner, 1976).

The children's ability to demonstrate their knowledge of metaphor is in part due to the sensitivity of the sentence completion task. Having to provide a reason for an assertion (i.e., having to say *why* "Bob's father said Bob's room was a junkyard") appears to focus the child's attention on the metaphor's ground. Consequently, the metaphor's ground becomes the most plausible completion. Children appear to understand that their job is to complete the sentence, and they do this with ease. This ease in producing metaphoric completions may result from fewer demands in the sentence completion than in prior explication tasks (Asch & Nerlove, 1960; Billow, 1975; Cometa & Eson, 1978; Winner, Rosenstiel, & Gardner, 1976; Winner, Engel, & Gardner, 1980).

Although it is clear that children produce metaphorical grounds with great frequency, a close examination of these responses is necessary to reveal on which level of metaphorical analysis the

children operate. There is a clear main effect of metaphor type, where children generate the intended sensory-level grounds the most frequently, followed by grounds at the functional level and lastly at the psychological level. Furthermore, the data in Figure 2 are inversely related to these findings such that when a child does not interpret a metaphor at the intended functional or psychological level, he or she most likely understands it at a sensory level instead. In other words, if a child does not explain why *Alice's friend is an ice cube* in the psychological sense, he or she explains why *Alice's friend is an ice cube* in the physical sense instead. The developmental trend for this phenomenon also is marked. As children grow older, they are less likely to produce sensory grounds for functional and psychological metaphors and more likely to produce the appropriate intended ground.

That children produced sensory grounds for functional and psychological metaphors is highly compelling because it suggests that the difference between adults and children in understanding metaphor lies in the *type* of ground they perceive, and *not* in the cognitive ability to make the metaphoric comparison. A sensory metaphoric ground, while appearing more superficial, is a metaphorical ground nonetheless. The cognitive process involved in making the sensory comparison may thus be the same as that for the psychological or functional metaphor. All types involve determining how the topic is like the vehicle.

Given that adults and children differ only in the type of similarity or ground that they perceive (and not in their general capacity to understand metaphorical language), we must examine

why this occurs. More specifically, why do some young children perceive only the sensory similarity in functional and psychological metaphors? Two different explanations are needed to explain the phenomenon for each type of metaphor.

First, for psychological metaphors the most parsimonious explanation is that children lack adequate word knowledge for comprehending these metaphors. Children need to be familiar with nonliteral meanings of polysemous words such as cold, hard and bright, which form the grounds of psychological metaphors. Other research also finds that young children have difficulty with the nonliteral meaning of double-meaning adjectives (Asch & Nerlove, 1960; Keil, 1986). However, as was found in the present study, a child who does not know what it means to be hard psychologically, as in *Tim's brother is a rock*, can at least explain how Tim's brother can be hard physically, e.g., Tim's brother has hard muscles.

The lack of knowledge explanation does not suffice to explain why young children produced sensory grounds for functional metaphors. The functional metaphors in this study were based on activities a child could experience during pretend play. Thus, children most likely had adequate knowledge to find the intended ground in these metaphors. Bruner's (1966) hypothesis that children's thinking is dominated by perceptual salience can be invoked to explain why children gave sensory grounds for functional metaphors. According to Bruner, pre-operational children maintain representations that are "iconic" or perceptual in nature. For young children, the sensory similarity between a metaphor's topic and vehicle is more salient than the functional relationship. Bruner's

hypothesis explains why kindergarten, and therefore presumably pre-operational, children showed a high probability of giving sensory grounds to functional metaphors, whereas by the second grade this probability declined drastically.

Research from other domains also finds that those who have a smaller knowledge base analyze information at a more surface level than those who have a deeper understanding. For example, Chi (1978) explains that one is limited by the size and quality of one's knowledge base in solving a problem. Adults with limited knowledge of a particular domain tend to focus on *surface-level* features of a problem. For example, a novice chess player may focus on the type of move each piece may legally make. In contrast, experts have a larger knowledge base, which includes not only the type of move each piece may make, but also numerous different board configurations and the best move for each configuration. Thus, with greater mastery and knowledge of the game, experts can use a deeper-level problem solving tactics in their approach.

One can draw the analogy that young children understanding metaphors are like adult novice problem solvers in that they are limited by the size and quality of their knowledge base. In understanding a metaphor, the sensory features of objects may be either the only or the most salient features available in their knowledge-base. Only when their knowledge base is sufficiently developed can they detect nonsensory relations among the topic and vehicle. Chi states,

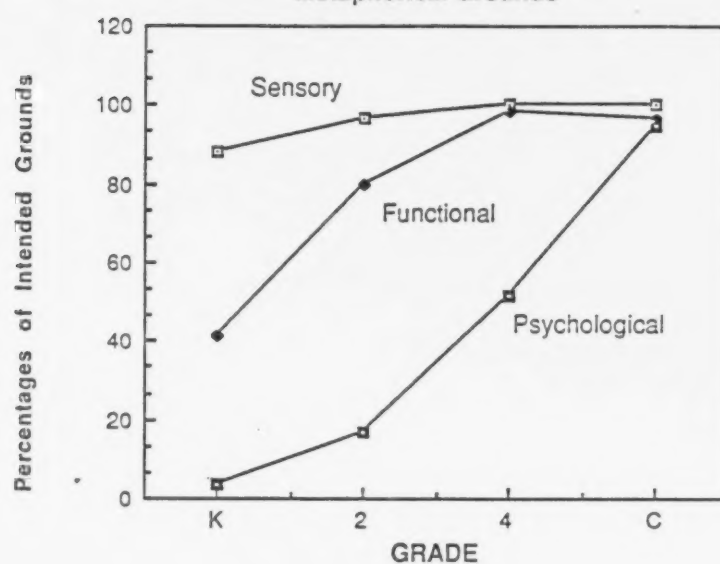
Knowledge affects development through the growth of the knowledge base. By growth

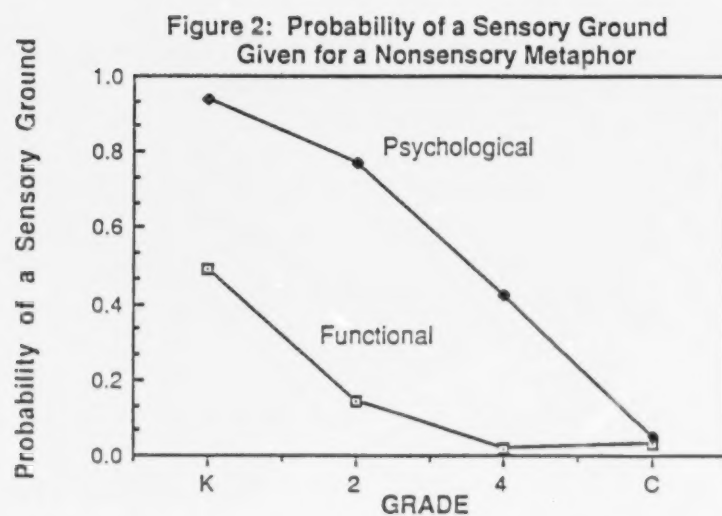
I mean simply that there are more concepts, more relations among the concepts, and so on in the semantic memory of an adult as compared to a child. Associated with the growth of knowledge is a better structure for that knowledge. A better structure may be one that has, in some sense, a more appropriate or valid set of relations among the concepts as well as a greater number of relations (p. 74).

From the results of the present study, it appears that in the comprehension of a metaphor, a child's knowledge base is the major factor influencing their capacity for comprehension. The main effect of metaphor type suggests that children can understand a metaphor when they have adequate knowledge; and children appear to have sufficient knowledge to understand metaphors at the sensory level. When a child's knowledge base is not fully developed, however, he or she cannot detect functional or psychological relations and instead uses salient sensory knowledge.

Finally, the present study emphasizes the necessity for conceptualizing metaphor comprehension as a multi-leveled construct rather than as a unilateral ability. If only psychological metaphors had been used in this study, the kindergarten children would have appeared deficient in the ability to make a metaphoric comparison. In actuality, young children are quite facile in comprehending metaphorical language, when the concepts involved are within their realm of knowledge.

Figure 1: Percentages of Intended
Metaphorical Grounds





References

- Asch, S. E., & Nerlove. (1960). The development of double-function terms in children. In B. Kaplan & S. Wapner (Eds.), Perspectives in psychological theory. New York: International Universities Press.
- Billow, R. M. (1975). A cognitive developmental study of metaphor comprehension. Developmental Psychology, 11, 415-423.
- Bruner, J. S., Olver, R. R., Greenfield, P. M. (1966). Studies in cognitive development. New York: J. Wiley.
- Chi, M. T. H. (1978). Knowledge structures and memory development. In R. S. Siegler (ed), Children's thinking: what develops? New Jersey: Lawrence Erlbaum Associates.
- Cometa, M.S., & Eson, M. E. (1978). Logical operations and metaphor interpretation: a Piagetian model. Child Development, 49, 649-659.
- Dent, C. H. (1984). The developmental importance of motion information in perceiving and describing metaphoric similarity. Child Development, 55, 1607-1613.
- Keil, F. C. (1986). Conceptual Domains and the acquisition of metaphor. Cognitive Development, 1, 73-96.
- MacKay, D. G. (1966). To end ambiguous sentences. Perception and Psycholinguistics, 1, 426-436.
- MacKay, D. G., & Konishi, T. (1980). Personification and the pronoun problem. Women's Studies International Quarterly, 3, 149-163.
- Ortony, A. (1979). Beyond literal similarity. Psychological Review, 86, 161-180.
- Piaget, J.(1928/1969). Judgement and reasoning in the child.

- Totowa, N. J.: Littlefield, Adams, 1969 (Originally published 1928).
- Pollio, M. R., & Pollio, H. R. (1977). A test of metaphoric comprehension and some preliminary developmental data. Journal of Child Language, 6, 111-120.
- Readence, J. E., Baldwin, R. S., Martin, M. A., & O'Brien, D. G., (1984). Metaphorical interpretation: An investigation of the salience imbalance hypothesis. Journal of Educational Psychology, 76, 659-667.
- Reynolds, R. E., & Ortony, A. (1980). Some issues in the measurement of children's comprehension of metaphorical language. Child Development, 51, 1110-1119.
- Trabasso, T., Stein, N. L., & Johnson, L. R. (1981). Children's knowledge of events: A causal analysis of story structure. The Psychology of Learning and Motivation, 15, 237-282.
- Vosniadou, S., & Ortony, A. (1983). The emergence of the literal-metaphorical-anomalous distinction in young children. Child Development, 54, 154-161.
- Vosniadou, S., Ortony, A., Reynolds, R. E., & Wilson, P. T. (1984). Sources of difficulty in the young child's understanding of metaphorical language. Child Development, 55, 1588-1606.
- Winner, E. (1988). The point of words: Children's understanding of metaphor and irony. Cambridge, MA: Harvard University Press.
- Winner, E., Rosenstiel, A. K., & Gardner, H. (1976). The development of metaphoric understanding. Developmental Psychology, 12, 289-297.

Winner, E., Engel, M., & Gardner, H. (1980). Misunderstanding metaphor: What's the problem? Journal of Experimental Child Psychology, 30, 22-32.

Appendix A: Metaphoric Sentence Stems

Sensory Metaphors

1. Bob's father said Bob's room was a junkyard because
2. John picked up the garden hose & called it a snake because
3. Kim said clouds in the sky are giant marshmallows because

Functional Metaphors

1. Dan said the empty garbage can was his drum because
2. Dave called the big rock his chair because
3. Sue said the branch of the tree was her pony because

Psychological Metaphors

1. John's mother called John a ray of sunshine because
2. Alice said her friend was an ice cube because
3. Tim said his brother is a rock because

PRACTICE METAPHORS

1. Jen said her brother's nose is a banana because
2. Dan always calls the sun an orange because

Appendix B

Codes for Responses*

Code	Example	Definition and Scoring Guidelines
Magical	John's mother called John a ray of sunshine because he was orange. (P)**	Response is not plausible in the natural world. Reality is achieved by inventing magical possibilities.
Metonymic	John picked up the garden hose and called it a snake because he was going to play with it as snake (S); Dave called the big rock his chair because it was a rocking chair (F); Alice said her friend is an ice cube because she was an ice cube for halloween (P).	Response makes an attempt to maintain reality by linking the topic and the vehicle in some literal fashion.
Sensory Metaphoric	Kim said clouds in the sky are giant marshmallows because they're white and fluffy (S); Dave called the big rock his chair because it's flat and smooth (F); Tim said his brother is a rock because he feels hard, has hard muscles (P).	Topic and vehicle are grounded in sensory similarity.
Functional Metaphoric	Dan called the empty garbage can his drum because he could turn it over and take two sticks and bang on it like a drum (F); Sue called the branch of the tree her pony because she could ride, sit, play on it (F); Dave called the big rock his chair because he could sit on it (F).	Topic and vehicle are grounded in functional similarity.
Psychological Metaphoric	Alice said her friend was an ice cube because she was mean, uncaring, unfeeling, unfriendly (P) Tim said his brother was a rock because he was hard, mean, stupid, stable, dependable (P); John's mother called John a ray of sunshine because he was warm, sweet, nice, bright and cheerful, friendly, happy (P).	Similarity between topic and vehicle is achieved by applying physical attributes of the vehicle to psychological attributes of the topic.

Inappropriate metaphoric

Kim said clouds in the sky are giant marshmallows because you can move a marshmallow and sometimes clouds move by themselves (S); John's mother called John a ray of sunshine because he was a good boy (P).

Response is in the correct metaphoric domain, but the ground is incorrect.

Incomplete

Kim said clouds in the sky are giant marshmallows because marshmallows are white (S); Dave called the big rock his chair because it was a big rock (F); John's mother called John a ray of sunshine because sunshine is yellow (P).

Either no response is given or the response describes only the vehicle in the metaphor.

*Guidelines based on those offered in Winner, Rosenstiel, & Gardner (1976).

**Type of metaphor abbreviated in parentheses after each example.